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U.S. Chemical Defense and the Third-World Threat

A Monograph
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ABSTRACT

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This monograph discusses the United States Army's chemical defense posture in relation to the chemical warfare threat in the third-world. It seeks to determine if current U.S. chemical defense tactical doctrine is adequate to counter the expected threat, and practiced enough to develop proficient execution in the field.

Following an overview of chemical warfare, the study reviews the current chemical threat focusing on the third-world. It explores availability, proliferation, acquisition and development, means of employment, and factors limiting employment. After a discussion of U.S. chemical defense doctrine, the paper posits three scenarios of chemical use against Army forces in three environments: the jungles of Honduras, the desert plains of Lebanon, and the mountain passes of Korea.

The study finds that the chemical threat in a jungle environment will be low, that in the mideast low to medium, and that in Korea high. Yet, in each of these third-world locations, regardless of the threat or use the probability of use, is not great. It argues that throughout military history chemical warfare has never lived up to its promise, and has never been tactically decisive. The paper concludes that the combination of the viable U.S. chemical defense doctrine with the non-decisive nature of tactical chemical weapons reduces the impact of battlefield chemicals, and that improved training will ensure this result.

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I. Introduction

Chemical warfare is the embodiment of the fog of war. Since their introduction to modern warfare, chemical weapons have been used to gain a tactical advantage on the battlefield, and recent indications are that the chemical threat may be decreasing in the Warsaw Pact but increasing in the third-world. Many potential adversaries of the United States either possess stockpiles of chemical weapons, have the capability to develop or buy chemicals which can be used to produce chemical weapons.' The United States has renounced the first use of chemical weapons, and has retained a limited offensive CW capability as a deterrent for use against U.S. forces. Although the United States can conduct limited offensive chemical warfare, increasingly, for the United States, chemical warfare means chemical defense.

The Soviet Union possesses the most highly-developed chemical warfare organization in the world, and because of their leadership of the Warsaw Pact, the nations of Eastern Europe also possess a robust CW capability. Although war in Europe presents the greatest risk to the United States, it is the most unlikely, in light of the rapid political changes occurring, as this paper is written, in the USSR, Poland, Hungary, East Germany, and elsewhere in Eastern Europe. As demonstrated in Grenada, Beruit, the Persian Gulf, and Panama, conflict in the third-world is much more likely. Increasingly, war in the third-world may mean chemical weapons.

This paper examines the current chemical warfare threat, the potential for chemical warfare in the third-world, and the chemical defense capabilities of the United States Army to counter this threat. Three scenarios of chemical use against Army contingency forces in Honduras, Lebanon and Korea, serve to focus the inquiry.

Although the U.S. has an offensive CW capability, it will not be considered. Early political approval by the National Command Authorities is not likely, and the reduced U.S. retaliatory capability leaves some doubt as to its viability. The use of chemical weapons by terrorist organizations is a possibility, but will remain beyond the scope of this study, as will biological agents or the organic toxins and mycotoxins that straddle the line between chemicals and biological agents. Biological agents usually take much longer than chemicals to produce a military effect, and although organic toxins and mycotoxins act as quickly as chemicals, the defense against them is similar to chemical defense.

Mission accomplishment in a chemical environment depends on the degree of success in the five domains of chemical defense. The first, individual protection, are actions taken by the individual soldier to protect him/herself from the affects of chemical agents and to reduce adverse affects when contaminated. The second, collective protection, are steps taken by groups of soldiers acting together to reduce the impact of CW. The third, detection and warning activities, alert individuals and organizations to the presence of a chemical hazard. The fourth, decontamination, seeks to remove or reduce the source of chemical contamination on people, equipment and the environment.

Lastly, medical activities, encompass steps taken to prepare soldiers for chemical agent contamination or treat them once contaminated.[1] It is the opinion of this writer that, on balance, U.S. chemical defense doctrine is sufficient to meet the threat in the third-world, but the lack of focus on individual, staff, and unit preparedness casts doubt on the ability of American military organizations to effectively function in a chemical environment.

II. Chemical Threat

World War I

Modern chemical warfare started in the early evening of 22 April 1915 when the Germans vented the contents of 6000 chlorine gas cylinders near Ypres, Belgium, on unsuspecting French colonial and British territorial troops. Surprise was total and the effects devastating, with 5,000 killed and 10,000 wounded.[2] After the first use both sides made increasing tactical application of poison gas. Chlorine was joined on 19 December 1915 by Phosgene which wounded 1,069 and killed 120 during its first use. Both of these agents were respiratory gases. Phosgene, when inhaled caused victims to drown as bodily fluids collected in the lungs, while chlorine was faster acting and burned the upper respiratory system. Although effective when initially used, the gas mask proved an adequate countermeasure.

The respiratory gases were joined by Mustard, the first liquid chemical agent, which destroys skin tissue. First used on 12 July 1917 by the Germans against the British at Ypres, it wounded 2490 and killed

87 on the first day, and in four days caused 14,276 casualties, including 500 deaths. As a touch hazard it compounded the countermeasure problem because normally exposed skin surfaces had to be covered with chemically impregnated clothing to prevent injury. Even with a late start, by the war's end mustard was the largest chemical casualty producer. The use of choking agents and blister agents together produced a devastating effect that produced casualties, slowed military operations and increased the burden on medical evacuation and treatment facilities.[3]

Several lessons can be drawn from the use of chemical weapons in the First World War. The first was that although there were over 1,300,000 chemical casualties (6.2% of the 21 million total casualties) and 91,000 deaths (1.3% of the total), chemical weapons were not the mass murderers sometimes portrayed. Chemical weapons had an impact on operations, but they were not decisive.[4] They were effective for specific purposes such as contaminating artillery firing points, rear services locations or lines of communication, yet, the logistical burden and the primitive delivery means (cylinders, artillery shells) limited their impact. They did not lead to tactical success, nevertheless, they had become accepted weapons of war and near the end of the conflict 50% of each artillery barrage contained chemical shells. The use of chemical weapons did not accelerate victory, the stalemate on the Western Front persisted with increased horror.[5] However, they did have a psychological effect out of proportion to the physical casualties. The specter of poison gas resulted in the 1925 Geneva Protocol, which was signed by 100 nations, excluding the United States. It prohibited

the use of chemical weapons, but not their production, transfer or stockpiling.

Additional lessons from that war are still valid today. Choking agents, although they produce casualties, are of little effect against troops with protective masks, or when meteorological conditions are not ideal for their use. The belligerents also learned that mustard, pound-for-pound, is the best agent on the battlefield for casualties and for the disruption of operations.[6] A combination of a vapor to produce immediate casualties through inhalation and a liquid to cause long term contamination throughout the area of operations is an optimum method of chemical agent employment.

Chemical weapons produce the most casualties when used against unwarned, unprepared troops. The chemical defense learning curve is short for military forces with adequate doctrine and equipment.[7] An example of this is seen above in regard to the choking gases. There was a precipitous drop in the number of casualties from the first use of chlorine to the later introduction of Phosgene, a clinically more deadly agent.

The Modern Threat

International political restraint has been only partially successful in the control of chemical weapons. The growth of chemical agents and weapons has been limited only by developments in chemistry.[8] And unlike nuclear weapons, chemical weapons are not concentrated in the hands of only a few nations. It is estimated that some twenty two nations possess chemical weapons, many in the developing parts of the

third-world, with many more possessing the potential.[9] Many countries see chemical weapons as ordinary weapons to be used in conventional operations.

Chemical agents are categorized by dispersal mode, type of agent, duration of potency, and delivery means.[10] Often called "poison gas", most chemical agents are liquids which are dispersed either as droplets or vapors. Militarily important agents are of three types: choking agents which are inhaled and damage the respiratory track; nerve agents which are inhaled or absorbed through the skin and interfere with nervous system function; blister agents which burn and blister the skin, eyes and respiratory system.[11] Potency is either nonpersistent (i.e. minutes), semipersistent (i.e. hours), or persistent (i.e. days or weeks). Chemical agents become weapons when they are wedded to a delivery system. The most common are aircraft spray, bombs, artillery shells, rockets and missiles, and land mines.

The factors that influence the behavior and tactical effectiveness of chemical agents are the method of dissemination, the weather, the terrain and the level of chemical defense preparedness of the target troops.[12] Tactical chemical agents are most often disseminated by bursting-type munitions and spray devices. An air- or ground-bursting round disperses the agent in all directions, driving some particles into the ground and sending the rest into the air as droplets and vapor. Spraying from aircraft produces an immediate vapor cloud which covers a large area downwind from the line of release.[13]

Meteorological conditions are highly significant in determining the tactical effectiveness of chemical weapons. The rate of evaporation of liquids and rate of dispersion of vapors is increased as the temperature rises. so high temperatures increase the vapor effect of liquids. Sunlight causing higher temperatures. speeds up vaporization and acts as a catalyst to agents. The more stable the air is in the target area the greater will be the tactical effect. Temperature gradient. the difference in temperature between two levels of air. has a pronounced impact on chemical weapon effects. An inversion. an increase in temperature with an increase in height. is the most stable condition and is best for chemical weapon employment. This condition usually exists on a clear night. A lapse gradient. where temperature decreases with height. is the most unstable of conditions and is the least favorable for agent use. High winds speed evaporation of liquids and speeds the dissipation of resulting vapors. High humidity increases the effectiveness of blister agents on skin but generally degrades vapor effectiveness. Because most chemical agents are not soluble in water. precipitation has little direct consequence on effectiveness other than diluting and spreading the contamination.[14]

Topographic characteristics most important for chemical weapon effectiveness are contour. vegetation, and soil composition. Under stable conditions chemical agents conform to the contours of the land and physical barriers in their path. Vegetated areas are more effectively contaminated because liquid agents adhere to foliage and remain potent in the absence of wind and direct sunlight.[15] Porous soil

absorbs more liquid agent, locking it in to be released later, thereby prolonging the effect.

This chapter has described the history and the nature of the modern chemical warfare threat. The next chapter will examine the chemical warfare threat in the third-world discussing acquisition, development and proliferation. It will set the stage for a later discussion of defense in today's expected chemical environment.

III. Third-world Chemical Warfare Threat

General

Chemical weapons are often called the poor man's atomic bomb. Many smaller nations may view chemicals as the "equalizer" in international conflict. All recent instances of the use of lethal chemical agents have been in the third-world.[16] The earliest post-World War II employment was by the Egyptians in the 1960's in South Yemen, but the 1980's have produced the most widespread use since 1918.

While the United Nations has documented the use of chemical/biological agents in Afghanistan, Laos and Kampuchea, the Middle East remains the hotbed of chemical agent development and employment.[17] The eight-year Iran-Iraq War, which ended in August 1988, saw widespread use of chemicals against both military forces and civilians. Outnumbered in population 48 million to 17 million, Iraq used chemicals as an equalizer to prevent loss of the war by attrition. With the start of the war in 1980, the State Enterprise of Pesticide

Production (SEPP) supervised the development of a chemical warfare production capability.[18] A facility at Samarra outside of Baghdad produced mustard and Tabun, a nonpersistent nerve agent.[19] Using chemical agents obtained from the Soviet Union and those developed at Samarra, beginning with non-lethal agents, the Iraqis employed tactical chemical weapons to overcome the Iranian numerical advantage. Chemical warfare was primarily defensive to stop Iranian offensives, not launch Iraqi attacks. By 1988 both Iraq and Iran were routinely using chemical agents. They were a fixture of the last years of the war and may have contributed to the Iranian decision to accept a UN mediated cease fire in the summer of 1988.[20]

During the Gulf War, the use of chemicals was not confined to purely military operations. In March 1988 Iraq employed mustard, choking and nonpersistent nerve agents against its pro-Iranian Kurdish minority, attacking Halajba, a city of 70,000 people in northeastern Iraq, near the Iranian border. The unsuspecting and unprotected population suffered 5000 deaths.[21] When this information is viewed along with the use against civilians in Laos, Kampuchea and Afghanistan, it is apparent that chemicals are increasingly becoming the weapon of mass destruction in the third-world.

Some preliminary conclusions about third-world chemical agent use can be drawn from this brief review. The third-world has little reluctance to use chemicals. Chemicals are still used first against an enemy that cannot retaliate (Iran did not have a chemical warfare capability when Iraq initiated chemical use). Iran followed suit as soon as it was able, reemphasizing that potential retaliation in kind is

the hallmark of chemical warfare. Effective world censure did not occur against those employing chemical weapons. External supplies of chemicals and chemical weapons were used until internal sources could be developed. Most important of all, as in World War I, chemical weapons did not prove decisive.

Chemical Weapon Acquisition and Development

Chemical weapons are available in the third-world, provided by a sponsor nation, transferred from a sponsor nation through a third country, purchased on the worldwide arms market, or developed internally. The sponsor of choice has historically been the Soviet Union. Because it possesses a highly developed military-industrial complex in comparison to other sectors of its national life, its foreign aid has traditionally had a military cast. By the same token, with such an extensive chemical warfare capability, the Soviets often include chemical weapons in military aid packages. The Soviet Union has been the source of many of the chemical weapons used by third-world countries since World War II. They have provided chemicals, chemical munitions, delivery means, and technicians to direct employment or train the client state in chemical warfare.

While the Soviets are willing to provide chemical weapons and technology to a select group of clients, other nations are willing to become suppliers for hard cash. For example, Iran is suspected of supplying the chemical agents used by Libya against Chad in 1987.[44] and North Korea is suspected of supplying SCUD Bs with chemical warheads to Iran.[45]

A nation which wants a chemical warfare capability without help from the Soviets or third-world chemical weapon possessors, can approach the world arms market for chemical weapons, or components. For the right price, arms suppliers will provide chemical rounds or bulk military chemicals. They are readily available, although less visibly advertised.

The development of chemical weapons is detailed, but not complicated using the industrial and agricultural technology already present in even the poorest nation. The chemical composition of most common agents is known, and components can be purchased on the open market. The development of agents can be masked by other chemical production facilities, and every pharmaceutical plant, brewery and fertilizer factory is a potential chemical weapons plant. Yet, the development of a chemical warfare capability is not as easy as the conversion of an existing facility to chemical weapons production. It takes more than the desire to develop chemical weapons. It is expensive and time consuming. For Iraq, once the decision was made to acquire chemical weapons, the road to battlefield use was long and complicated. The Iraqi development is a textbook case of the acquisition of third-world chemical capability. It is described below to give the reader an indication of the complex nature of chemical weapon acquisition.

A West German trading company set up a branch office in Baghdad to broker construction, training and equipment contracts.[44] A German company supplied corrosion-resistant vessels, pipes, and sophisticated measuring equipment to the Iraqi State Enterprise for Pesticide

Production (SEPP), which was installed at the SEPP facility at Samarra. Chemical and trading companies from around the world provided several inconspicuous quantities of chemicals, including the solvent thiodoglycol, a precursor of mustard, and phosphorous trichloride and potassium fluoride, precursors of nerve agents. Most chemicals have multiple uses, but subsequent use of chemical agents by the Iraqis indicates that Samarra probably produces chemical agents. In November 1983 Iranian troops were first hit with mustard. It took Iraq three years after the initiation of hostilities to produce enough agent to make it tactically significant.[23]

A similar story can be told about the Libyan facility at Rabta, which according to the U.S. CIA is the largest chemical weapons production plant in the third-world.[24] However, this tortured trail points out a problem in development of chemical agents in the third-world. Outside help is needed for technical assistance, construction, feedstocks, and training. Self-sufficiency is expensive, so most impoverished third-world countries continue to look to patrons for chemical warfare needs. In addition, under international pressure, many of the developed nations are taking steps to limit the shipment of chemicals and equipment that can be made into weapons to the third-world. This makes it harder for the prospective chemical agent producer to master the complicated program needed for success.

A further hurdle is the difficulty in "weaponizing" the agent.[25] A chemical must be wedded to a delivery means to produce a weapon. An aerial spray system is the easiest to develop, but the most difficult to use effectively on the modern battlefield. Aerial bombs are easy to

acquire and fill, but require at least air parity for effective tactical delivery. Field artillery rounds are the most responsive tactical chemical weapons, but entail the purchase and filling of shells. Weapons production requires additional manufacturing facilities to handle, store, process the raw agent, and fill the delivery means. As the most highly developed chemical weapon producers in the third-world, both Iraq and Libya have collocated weapons production facilities with their agent production facilities. This is an expensive undertaking and can only be afforded by countries with adequate financial resources.

Factors Limiting Employment

Granting the availability of chemicals and an appropriate delivery means, the key to weapons development is a trained military force capable of offensive use. Training is the process that gives substance to doctrine and training is the area where third-world nations are weakest. Because of an undereducated population, the military training in most third-world nations tends to be rudimentary, with only selected elites given specialized training. A decision to employ offensive chemicals would necessitate a thorough training program in their use. The third-world nations that have used offensive chemicals have taken a long time to develop the sophistication necessary for effective use. It took Iraq two years to improve its use of chemical agents and the training of its chemical corps before it could use them well enough to affect Iranian operations.[28]

Because of the chance of retaliation in kind, any nation contemplating offensive use of chemical weapons must be prepared for

chemical defense. The technology for chemical defense is not complicated, but most third-world military organizations have not spent the funds to acquire the capacity. The efforts of Iran to develop a chemical defense capability to counter the Iraqi threat, while simultaneously pursuing offensive chemical warfare proficiency, were still unfinished when they agreed to the UN ceasefire. Doubt exists about the capability of most third-world nations to adequately defend themselves against chemical weapons and this fact, more than a repugnance to chemical use, tends to limit employment.

Even with its own chemical weapon production facility, Iraqi chemical use was intermittent and declined after 1984.[27] The reasons for this are complex, but include the Iranian ability to retaliate in kind, the difficulty of proper tactical employment, and the non-decisive nature of chemical use. The ability to produce chemical agents in quantity does not mean that the delivery means are available or that the tactical situation permits effective employment. The ability of most third-world nations to sustain a chemical warfare effort is a limiting factor in chemical use. Whether the chemical warfare effort is supported externally or internally, there will have to be a steady source of supply, sufficient delivery means, continual technical assistance, and ongoing training. A military force which initiates chemical warfare and then runs short of the means to prosecute the war in that manner will be in a difficult position. Unless it can achieve a moral victory before the deficiency is discovered, it will surely suffer from retaliation. Not only must a military force possess the means to start the war, it must also sustain it.

Proliferation

Regardless of the means of acquisition, proliferation is accelerated by states which feel compelled to have chemical weapons to deter a first strike. Stockpiles of chemical weapons, whether provided by an external source or developed internally, are perceived as a threat, especially by traditional adversaries. This has international implications because a nation-state with a chemical warfare capability, especially a "have not" nation, may want to use it against a more powerful adversary. Many third-world countries have military chemicals and the delivery means to mount a credible threat. The coupling of chemical warfare capability with hostile intent is a danger that exists in varying degrees in many parts of the world.

Chemical weapon proliferation will impact future U.S. military operations in the third-world. Although the ability of the United States to retaliate may limit chemical weapon use against American forces, the risk of harming civilian populations is so great that the threat of U.S. retaliation is reduced. As stated in the current draft of FM 3-100, NBC Operations:[30]

> Whether an aggressor would use chemical agents against well-trained and well-equipped forces who possess a devastating array of retaliatory options cannot be predicted. A decision to use chemical weapons against US forces may seem ill-advised; however, politico-military decisions of this nature do not always follow western logic.

The United States Army must be prepared for chemical defense in the third-world. The next chapter outlines the principles of chemical defense doctrine in general, and in accordance with U.S. Army field manuals.

IV. Chemical Defense

Chemical Defense Doctrine

Chemical defense is any action taken to protect a force and conserve its combat potential. The capability for chemical defense is indispensable for any military force.[21] Such a system must be comprehensive enough to create the level of morale and confidence necessary for effective combat performance in a chemical environment. The five interrelated principles of chemical defense are detection and warning, avoidance, protection, decontamination and medical treatment. Detection and warning involves the early identification of a chemical threat and the rapid propagation of warning information. It is a phased system of observation by the military force as a whole and specialized information collection by specially-trained chemical soldiers, all tied to a coordinated warning and reporting network to collect, collate, analyze and disseminate information on the chemical threat. Ideally all soldiers will receive chemical defense training and have chemical detection equipment to assist them in their mission. These detection devices include sophisticated electronic alarms, detector paper which changes color in the presence of a chemical agent, and specialized kits for performing chemical analysis on samples of suspected agent. Early detection permits a military force to avoid chemical contamination and to take steps to reduce its impact.

Avoidance is the most important fundamental of chemical defense. It depends on active methods of reducing risk, such as an effective detection and warning system, and a means for identifying and marking

contaminated areas. In addition, contamination can be avoided through passive measures such as operational security to reduce the intelligence signature of the force, dispersion of potential high value targets, hardening of equipment, and preparation of units by proper training.[32] Early recognition of the threat and coordinated measures to counter it will enhance chemical avoidance.

Protection involves the hardening of forces by passive and active measures to reduce the risk of death or injury. Passive measures involve the encapsulation of the individual soldier or small unit to preclude chemical contamination. Individual encapsulation is best done with a specially-designed chemical protective suit that contains boots, an overgrament, a protective mask, a hood and gloves. Although it can be of many different types, the mask is designed to guard the respiratory system from poison vapors, while the overgarments are to protect the skin from absorption of lethal vapors or liquids. Protective levels, called Mission Oriented Protective Posture (MOPP) in the U.S. Army, are used to direct uniform response to a chemical threat. The level of protection assumed must be balanced with the need for mission accomplishment, because the greater the encapsulation, the greater is the degradation of performance. While encapsulated individual dexterity and fine motor skill are retarded, maneuver is slowed, command and control is disrupted, communication is degraded and, individual performance is reduced.[33]

Collective protection involves vehicles and structures that are shielded from chemical contamination and which have a filtration system to purify the air to permit the removal of protective mask and

overgarments. Collective protection systems, including those in armored vehicles (such as the Soviet BMP armored personnel carrier and the American M1A1 tank) are in use by the armies of the world, but the expense of fielding, and the difficulty of use, means that only a small fraction of a force is afforded specifically-designed collective protection. Collective protection is usually provided by the simple expedient of entrenching or occupying a building. Specially-designed collective shelters are most often used for command posts or medical facilities. Effective protection is enhanced by: thorough education on chemical warfare, effective training, frequent exercises to increase the confidence in protective equipment, and a proven detection and warning system. All these measures will increase individual morale if supported by good leadership.[34]

Having failed in timely detection, efficient avoidance and effective protection, a military force must be decontaminated to regain its combat effectiveness. Decontamination involves the removal of chemical agents from skin, clothing, equipment and structures, or the exchange of contaminated items for clean ones. It occurs at three levels. Individual decontamination removes the agent from skin and personal equipment. Hasty decon is the exchange of protective gear and the removal of contaminates from the parts of equipment and vehicles likely to be touched. Deliberate decon involves the elimination of contaminates from personnel and equipment. Each level from individual to deliberate takes more time but has greater payoff in increased ability to continue the mission. Decontamination of vehicles and equipment requires the use of caustic decontamination solutions, which

demand special handling. Well-trained soldiers and units are taught decontamination techniques, but effective decontamination requires special chemical decontamination units and staffs with extensive logistic support. Only medical activities take more manpower than decontamination.

Chemical agents produce mass casualties and require extensive medical support. Most chemical casualties do not die immediately so a comprehensive medical treatment effort is needed to identify the degree of injury and reduce mortality. Complex battlefield medical functions become even more involved on the contaminated battlefield. Medical specialists must work closely with chemical specialists when treating affected soldiers to avoid becoming casualties themselves. Treatment involves decontaminating, stabilizing the patient, and preventing infection. But damage to the respiratory and nervous systems are difficult to treat. Prophylactic measures are primitive, and limited to injection of antidotes to protect body tissue in the case of nerve agent poisoning. Medical activities are the most underdeveloped aspects of chemical defense.

U.S. Chemical Defense Doctrine

The United States has renounced the first use of chemicals as weapons of war, though we maintain a stockpile of chemical weapons and have recently taken steps to upgrade those inventories. The U.S. Army maintains a research, development and production effort as a precautionary measure. The operational paradigm for U.S. chemical defense is to establish a strong technological base of research and

development, promulgate appropriate chemical warfare doctrine, and procure and deploy equipment to enhance mission accomplishment.[35] In the last decade, U.S. chemical defense doctrine has been rejuvenated after a decline in capability since the Vietnam War. The chemical threat has not been eliminated through arms control and the burgeoning threat in the third-world has prompted renewed U.S. efforts.[36] In the face of the continued spread of chemical weapons, proficiency in chemical defense doctrine is prudent. Those efforts are codified in the "3- series" field manuals produced by the U.S. Army Chemical School covering contamination avoidance, protection, decontamination, NBC operations, chemical staffs and units, and other technically-oriented publications.

Field Manual (FM) 3-100, NBC Operations, is the capstone NBC warfare manual summarizing all aspects of chemical defense.[37] As the most important principle of chemical defense, contamination avoidance is treated in FM 3-3, NBC Contamination Avoidance. Doctrine calls for avoidance using active measures such as finding and destroying enemy chemical munitions stockpiles and destroying delivery systems. Passive measures include chemical defense planning, OPSEC, dispersion, disciplined NBC posture, establishment of a warning and reporting system, and command emphasis to limit exposure and spread of chemicals.[38] A family of detection devices assists in identifying agents.[39]

Effective avoidance is closely tied to the NBC Warning and Reporting System (NBCWRS) established within each Army division and at higher echelons. The system takes observer reports from units

encountering chemical attacks or contamination, along with information collected by NBC reconnaissance teams to disclose the presence, location and amount of contamination. Using a series of standard report formats, data is transmitted throughout the NBCWRS to keep commanders informed of the meteorological conditions, level of chemical threat, and areas of actual contamination.[40] Chemical staffs beginning at brigade level actively participate in the NBCWRS, but success depends on the participation of the soldiers from non-chemical units. In summary, U.S. contamination avoidance doctrine calls for both active and passive measures, location and identification of chemical hazards, active use of the NBCWRS, and movement from contaminated areas as soon as the mission allows.

Protection doctrine is contained in FM 3-4, NBC Protection, which deals with early warning and individual chemical protective equipment (ICE). The concept of Mission Oriented Protective Posture, or MOPP summarizes the amount of encapsulation in protective garments and equipment required to reduce risk. MOPP is a command directed flexible system that prescribes the type of ICE worn by the soldier, from simply carrying the ICE (MOPP 0) to full encapsulation (MOPP 4), as well as a variant that prescribes wearing only the mask. ICE includes suit, boots, gloves, mask/hood, first aid treatments, and decon kits, together designed to provide the lowest risk consistent with mission accomplishment.[41] In MOPP 4 a soldier is theoretically totally protected from a chemical threat, although the ensemble can be overmatched by massive chemical agent doses.

Protection is enhanced if units do not overreact to a chemical threat. Adequate shelters, properly positioning of agent alarms, proper use of detection paper, and correct MOPP will increase effectiveness. MOPP level is determined after a careful analysis of threat capabilities and weather conditions. A balance is achieved between mission, work rate, time available, detection and warning equipment, protection available, training and physical fitness level of the troops, and time of day.[42] Chemical protection has a heavy logistical burden and units must husband ICE. Operations in MOPP place a physical burden on soldiers and cause significant degradation in individual and unit performance. The actual performance loss will depend on several factors, but can approach 50% degradation in unit effectiveness in MOPP 4.[43]

Chemical decontamination doctrine is the subject of FM 3-5, NBC Decontamination. Casualties will increase without the prompt removal of a chemical agent from skin, clothing, and equipment. There are three types of decontamination: individual, hasty and deliberate. Each requires special techniques and equipment.[44] Individuals decontaminate by wiping agent from skin, personal equipment, and by spraying the areas of equipment that must be touched within 15 minutes of attack. In hasty decon, the squad and platoon-equivalent decontaminates unit assets, assisted by unit soldiers cross-trained in chemical defense. Aided by power-driven decon equipment (PDDE), enough contaminates are normally removed to permit a reduction in MOPP level. The goal of deliberate decon is to reduce MOPP to zero by removing all contaminates from unit personnel and equipment. It is done with the assistance of chemical

specialists from division or corps decon platoons using PDDE. Deliberate decon can take up to 90 minutes per vehicle. During deliberate decon, vehicles and equipment are cleaned and MOPP gear exchanged. Hasty and deliberate decontamination are logistically intensive activities requiring ample supplies of water, decontaminates, and cleaning equipment. Replacement ICE must be available and provisions made for the disposal of contaminated clothing, and control of drainage from the decon operations.

According to FM 3-5, NBC Decontamination, several principles guide decontamination efforts. They are: decon as soon as possible to get agents before they soak in and thus reduce the long term effects of contamination; decon only what is necessary to conserve decontamination capacity; decon as far forward as possible, or as close to the contamination as possible in rear areas, to limit the spread of contaminates; decon by priority doing mission critical items and equipment first.[45]

The U.S. Army has a comprehensive chemical defense doctrine, but often suffers from a lack of emphasis outside the Chemical Corps. Especially at the levels of tactical decision makers, there is an imperfect understanding of the principles of chemical defense and its importance in planning tactical operations. Too often chemical defense training consists of assuming different levels of MOPP and the periodic training of the various teams at small unit level. Seldom do large exercises include decontamination events or medical mass casualty exercises on the scale that could be expected in even a low-level chemical threat. Although a key subcomponent of the battlefield

operating systems, it is seldom given emphasis. Most chemical intelligence focuses on Europe, planning to counter the Warsaw Pact threat, but expends less effort in planning for non-European scenarios.

This chapter has focused on chemical defense doctrine. In the next chapter the paper will examine the deployment of U.S. forces to three non-European locations, investigating the potential threat, describing the behavior of chemical agents and estimating the readiness of contingency forces to operate in a chemical environment.

V. Three Chemical Defense Scenarios

Scenario Overview

The U.S. Army can become involved in conflict in the third-world in several ways: a confrontation between Soviet and U.S. forces in a third-world nation: an intra-regional confrontation in the Persian Gulf, or elsewhere, where the United States is engaged in "peacekeeping" duties: U.S. force projection into a third-world nation to protect U.S. national interests: or an attack on a U.S. installation located in a third-world country.[44] A scenario is selected for each of these ways except a direct Soviet confrontation. Honduras is an area of potential U.S. Army force projection. Honduras is an ally and U.S. forces could be called in to protect U.S. and Honduran national interests, especially along Honduras' border with Nicaragua. Such a situation will call for deployment into secure areas before moving to the border area. International political commitments often call on the United States to deploy military forces in world trouble spots. American forces are

already involved in United Nations peacekeeping duties in the Middle East and their role could be expanded to include Lebanon. In this situation opposed force projection into the country is possible. Finally, U.S. forces are stationed in Korea, and with troop dispositions and command relationships, any attack by North Korea on South Korea will involve American forces. In this scenario Army units are in place and will be operating in a mature theater. In all cases, U.S. forces are on the operational defensive.

Terrorist use of chemical weapons will not be addressed. Terrorist organizations are undoubtedly attracted to chemical weapons because of their mass destruction potential, ease of use, and psychological impact. Yet, according to a recent statement by a State Department official, there is no indication that terrorist groups possess chemical weapons or are planning to use them.[47] Third-world supporters of terrorist organizations, such as Moammar Khadafy of Libya, may be unwilling to risk international condemnation and military retaliation if tied to terrorist chemical warfare.

The scenarios, in three different parts of the world, were selected because they differ in climate, nature of expected threat, and probable U.S. contingency forces. Each location will be used as a framework to examine the third-world chemical warfare threat.

Honduras

U.S. forces routinely deploy to Honduras to conduct training exercises and to show support for the Honduran government. Such a deployment provides the opportunity for U.S. forces to operate in a

jungle environment, with its associated chemical warfare challenges. In this scenario, it is assumed that a light infantry brigade, with assigned and attached units, from a light infantry division, such as the 7th Infantry Division from Fort Ord, California, deploys to southeastern Honduras and takes up defensive positions in the jungle terrain along the Nicaraguan border.[46]

With a guard mission along the Honduran-Nicaraguan border, contingency forces will face a conventional military force, with military experts from Cuba or the Warsaw Pact for logistical and technical support. Chemical weapons could be supplied along with the technical experts to train Nicaraguan forces and assist in their use. However, because of the climate, there is a low risk of chemical use in this theater. Nicarauga has no known chemical threat.

Blister agents could be employed to cause casualties, harass, deny terrain, or contaminate a fixed facility.[47] Blister is easy to transport and could be delivered by artillery fire. However, weather conditions will reduce its effectiveness. High temperature and humidity will create local vapor hazards, but the lack of wind in the dense vegetation will primarily restrict the chemical threat to areas where chemical strikes occur. Frequent rainfall will cause physical dispersion and thereby diluting the agent and reducing its impact. These same things are true for choking and nerve agents as well. In spite of the weather, agents will remain potent and stay for long periods on the jungle floor. The combination of weather, terrain, heavy logistical burden and chance of retaliation will keep chemical

operations against U.S. forces small scale and localized. There will be no massive use.

Nevertheless, the U.S. contingency forces will still require a chemical defense capability to preserve combat power. Jungle operations pose unique operational problems that will degrade performance and require special attention. It takes a high degree of individual discipline, training, and conditioning to fight effectively in a jungle environment.

The light division has a light chemical organization. Each brigade has a chemical officer and a senior chemical NCO, while every battalion-size unit has a chemical NCO and a chemical specialist. There is no chemical company assigned to the division, so one will have to be provided in direct support by the corps for chemical reconnaissance and decontamination.[30] To strengthen the brigade's capability, chemical teams from corps, or echelons above corps, can be attached for required decontamination, reconnaissance and NBC Center support. Much of this support will come from the reserve components and its place on the time phased deployment list (TPFDL) must be given priority. The division chemical section will control chemical operations and conduct the NBC planning which will have to precede any commitment of forces.

To determine the level of preparedness each principle of chemical defense will be examined. Detection and warning will be primarily the responsibility of the deployed units. Under the supervision of the chemical specialists, and soldiers cross-trained in chemical survey and monitoring techniques, units will generate the standard reports that key

the NBC Warning and Reporting System (NBCWRS). Using the M8 Alarm, the M256 Chemical Agent Detector Kit, M8 and M9 Detector paper, the M1 Chemical Agent Monitor and medical condition reports of sick soldiers, potentially hazardous agents will be identified and verified. All available communications nets will be incorporated into the NBCWRS to get the word out to all organizations.

Because of the small unit nature of jungle operations, all leaders down to squad level will have to be properly trained in chemical detection, warning and monitoring. Once discovered, potential contamination must be reported, surveyed, marked, plotted on operations maps, and watched. It will be important for support bases to prepare for chemical defense because their fixed nature makes them likely targets for chemical attack. Because atmospheric conditions are optimum for employment of chemicals at night, high alert levels are required during the hours of darkness, or whenever chemical weapons conditions are ideal for employment. Rapid and effective identification will enable commanders to determine the correct MOPP posture.

Passive and active individual protection measures will be crucial to survival and retention of combat capability. Individual chemical protection equipment (ICE) and chemical defense equipment are often given low priority during the deployment of light forces, indicating to soldiers that chemical defense is not a serious undertaking. Soldiers must be briefed on the expected threat and given sustainment training in chemical defense. Individual protective equipment must be deployed. Elevated MOPP conditions will degrade soldier's capabilities very quickly in hot, humid conditions, so MOPP levels must be closely tied to

detection efforts. Protection must match the threat and allow mission accomplishment. Mission accomplishment is paramount. With the small scale nature of the expected attacks, it is not anticipated that whole units will spend long periods in elevated MOPP levels, but soldiers must be prepared.

Collective protection is possible in collective NBC shelters for selected medical and command and control units, but the most common form of collective protection will be vehicles and buildings, that will afford a level of protection for the expected liquid threat.

Decontamination will be necessary if units are attacked. Individual decon will not be a problem, but the lack of available decontamination assets and water sources will challenge the resourcefulness of leadership to provide the required decon sites. Medical readiness is always a problem in the jungle, where instances of sickness always rise. Sufficient medical units will have to be ready to treat chemical casualties in addition to the expected tropical diseases and immediately be able to distinguish between the two.

The threat of chemical use against U.S. forces in Honduras is low, but U.S. light infantry forces must come prepared to operate in a chemical environment. This will require chemical defense training of soldiers and units, chemical asset support from corps, and command empnasis on chemical defense planning. The limited chemical detense capability of light units can be reinforced, but command emphasis must be maintained. Some risk can be accepted in chemical planning for U.S.

deployment to Honduras, however, risk cannot be accepted in a deployment to the Middle East, a hotbed of chemical warfare development.

Lebanon

In Lebanon, U.S. contingency forces will face both urban guerrillas and well supplied conventional forces, advised by military experts from the Soviet Union and elsewhere. In this scenario, a brigade from the 82nd Airborne Division, Fort Bragg, North Carolina, conducts airborne landings on the gentle sloping plain outside of Beirut and takes up positions to separate warring factions in the Lebanese civil war. To increase the combat power of the force, a tank-heavy brigade from a mechanized infantry division, such as the 24th Infantry Division, Fort Stewart, Georgia, deploys by sea and joins the force. They are task organized into heavy-light formations, controlled by the mechanized division headquarters, and ready to defend on the east of the city to prevent Syrian attacks.[51]

Guarding the approaches to Beirut, U.S. forces will face Syrian conventional tank-heavy forces, with the capability to use chemical weapons. Syria has a developing chemical weapons program begun in the mid-1980s,[52] and supported with items from the menu of Soviet-supplied nerve, blister, blood and choking agents.[53] Tactically, chemical attacks will follow the Soviet employment pattern.[54] Nonpersistent nerve agent will be used against frontline troops for a quick kill and to achieve breakthroughs, while persistent nerve and mustard will produce casualties on bypassed troops, strongpoints, flanks and rear

areas. The persistent agents will be used for psychological impact because of the long term hazard.

Because of high temperatures and unstable air, daytime employment of chemical weapons in the warm months is only marginally useful. The effect will be greatest in the immediate target area. Because of rapid vapor cloud evaporation, most attacks will be on point targets. Liquids will soak into the soil and create local adsorption hazards. In the colder months and at nighttime, conditions create more stable air flows and present more favorable conditions for employment.[33]

U.S. forces will have to possess a robust chemical defense capability to counter the probable threat. The chemical defense organizations in airborne and mechanized divisions are much more substantial than in the light division. The division has a chemical section supported by two officers and a senior NCO with each brigade headquarters: an officer, NCO and NBC specialist with each combat battalion: and a senior NCO and chemical specialist with each non-combat battalion. Both the airborne and mechanized divisions posses: an organic chemical company with NBC Center, smoke and decon organizations. In addition, the heavy division has a chemical recon platoon.[34] In this scenario it is assumed that the controlling headquarters will supply its NBC command and control organization and that the divisional chemical companies will task organize to put the maximum capability into the field, augmented by corps and echelon above corps, chemical recon, decon and NBCWRS assets. Close ties will have to be maintained to weather forecasting detachments and to artillery meteorological sections to monitor the weather conditions for chemical employment.

As with the jungle scenario, detection and warning will be the responsibility of the deployed units under the supervision of chemical specialists and cross-trained soldiers. Because of the greater threat, the NBCWRS will have to be rigidly disciplined and command emphasis placed on the reporting, location, identification and monitoring of chemical attacks. Leaders at all levels will have to enforce disciplined implementation of chemical defense doctrine. Even more than in the jungle, alertness at night will be the key to battlefield success.

In the summer, because of the high temperatures, even at night, units will not be able to remain in elevated MOPP for long periods of time. Detection and warning activities will have to be thorough enough to provide relief from MOPP-induced stress whenever possible. Because of the high probability of use, replacement chemical defense equipment and ICE must have high priority.

Proper passive and active protection measures will reduce exposure to hazards, but decontamination will be needed. Chemical agents will be weathered by the sun and sand, but sufficient quantities of decontamination solutions and water will be needed to maintain combat power. Water will be a problem. It may not be available in large enough quantities to provide adequate decon facilities. With a higher threat, medical readiness will have to be increased with additional units and supplies.

The actual threat of chemical warfare in this scenario is low to medium. The enemy has the capability, but may not possess the will to

employ chemicals against a prepared force that can retaliate in kind, and that possesses other means to strike at deployed forces in the field and strike at fixed facilities and population centers in Syria itself. The decision to employ chemicals is a political one, and the aggressor may not want to accept the political and military consequences of such a decision. Nevertheless, the deployment of troops will entail detailed NBC readiness training, concentrating on individual skills and unit preparedness. As with the jungle scenario, vigorous and thorough chemical defense training will maintain combat power.

Korea

The United States Army has maintained a presence in Korea since the end of the Second World War, and South Korea is currently the most mature U.S. theater of operations outside of Europe. The 2nd Infantry Division will be involved in any invasion by the North in a "come-as-you-are" war against a nation that possesses the most highly developed chemical warfare capacity in Asia.

North Korea possesses one of the world's more highly-developed chemical warfare organizations, capable of producing chemicals, deploying delivery means, and fielding the organizations to employ them. It produces nerve, choking, vomiting, blood and blister agents at eight locations, but may still have to rely on external sources for some agents.[5] The North Koreans are a major chemical threat with chemical troops making up about 1.2% of its military force. They have a good army that is well trained.

Cold Korean winters are generally unsuited for the employment of chemical agents.[58] Although the temperature will make all agents more persistent, the vapor pressure is also suppressed so that there is little vapor hazard. Effects are localized, and some agents freeze at high enough temperatures (mustard freezes at 58°F) that they are ineffective as casualty producers in the cold. In winter operations, chemicals will be used to harass and for psychological effect. Attacks with nerve agents on fixed installations will force troops to mask and evaporation will take several hours during which time operations will be degraded. Most liquid agents will remain so and will be absorbed into clothing and equipment. However, chemical employment in very cold weather will have minimal effect on military operations and may not be worth the effort. Cold weather chemical operations favor the defense because the agents become more localized, are reduced in effectiveness, and are easier to decontaminate because command and control is usually established. However, frozen water will create decontamination problems.

During the summer, thickened nerve agent and blister agents, in conjunction with regular fires, will be used to deny terrain and produce casualties in the narrow valleys below the DMZ. Fired on secondary avenues, they will have great psychological impact and cause overreaction in untrained and inexperienced troops. Agent effects will be similar to those described above for Lebanon.

In-place U.S. forces have the chemical infrastructure of a heavy division, with chemical officers and NCOs at brigade and combat battalion level, and NCOs at CS and CSS battalion level. The division

has a chemical company with organic decon and recon platoons. However, as with other American units, chemical defense is mainly the responsibility of cross-trained officers, NCOs and soldiers.

In the warm months, detection and warning activities will be similar to those described for Honduras and Lebanon, but in the colder months detection will be markedly different. Chemical defense becomes more difficult in the cold. The operation of standard alarms and detection devices is impeded by cold temperatures and frozen agents. Below 15°F, the M256 kit will not give accurate readings and detection paper will not work with frozen agents.[39]

In cold weather, protection is enhanced because most skin areas are normally covered, and elevated levels of MOPP are welcomed for the added warmth provided. But elevated body temperatures which cause perspiration increase the chance of cold weather injury. MOPP will still be required. Problems will develop at very cold temperatures because masks and other items of chemical protection equipment freeze or become stiff, making them hard to use.

Decontamination will still be needed but made more difficult because water and decontamination solutions freeze and are not effective. Skin decon kits and nerve agent antidotes will freeze and become useless complicating removal of the agent. A problem requiring special diligence will be the detection and decontamination of frozen agents that become hazardous when warmed through exposure to the heat of building and vehicles.

U.S. forces, in conjunction with their South Korean allies, face a well-trained force capable of using chemical weapons. The threat is high yet the probability low, especially during the winter months. It will be significantly higher in the warmer months. As with the other scenarios, the political permission to use chemical weapons may be withheld because of fear of retaliation on fixed installations and population centers in the North. U.S. chemical defense posture is on a par with other mature theaters (CONUS and USAREUR) but will have to be enhanced with training initiatives and added equipment to maintain the operational tempo necessary to defeat the North Koreans. The high risk of chemical use must be matched with a corresponding high level of training and chemical defense readiness.

VI. Conclusions and Implications

General Conclusions

At present, nothing, not even nuclear weapons, can promise greater disruption and degradation of combat effectiveness than might be achieved by the judicious use of chemical weapons on the modern battlefield.[40] Yet, since their first employment more than seventy years ago, the promise of chemical weapons has never been fulfilled. Never has the military use of chemicals led to a decisive tactical victory. The result has been either a stalemate, or the continued disintegration of an unprepared enemy. This apparent lack of effectiveness notwithstanding, what general conclusions can be drawn from this study of chemical weapons?

Chemical weapons are killers. Especially against unwarned and unprepared troops, they produce rapid and delayed casualties, which quickly overburden the medical evacuation and treatment system, or panic which disrupts military operations. Because of the panic created by the lethality of a chemical battlefield, the tactical plan often becomes secondary to survival. Only the iron will of commander and well trained troops will mitigate this situation.

Initial chemical use is "asymmetric". Chemical weapons have never been used against a force capable of immediate retaliation in kind. Chemical deterrence is enhanced by a chemical warfare capability, no matter how small. As the absence of any use of chemical weapons in the Second World War demonstrated, chemical weapons only deter chemical war, not general war. The present United States policy of no first use of chemicals coupled with a weak retaliatory capability would seem to invite use against U.S. forces. The U.S. must appear willing to use its strong non-chemical retaliatory capability, to enhance deterrence.

The chemical weapon employment decision is political in all nations. Fear of world condemnation has not prevented third-world nations from using chemicals, but none have publicly admitted use. Even when confronted with strong proof of agent use during the Iran-Iraq War, both belligerents denied it.[41] The use of chemical weapons is still beyond the boundaries of civilized conduct for most nations.

Military experience in this century indicates that chemical weapons alone will not win wars. Against well-trained and prepared troops, chemicals will produce casualties, but will not be decisive.[42] Unless

used as part of a comprehensive tactical plan in conjunction with conventional weapons they are not a significant force multiplier. Although, inept employment may be at the root of this indecisive nature. If the experience from the Gulf War is any indication, it takes several years for a third-world army (or any army) to develop the command, control and sustainment techniques necessary for effective chemical weapon employment.

Conclusions From The Scenarios

Many third-world nations possess chemical weapons, or have the ability to get them. The scenarios presented above describe third-world aggressor use against U.S. Army forces. What lessons can be drawn from them? First, the effective use of chemical weapons is reduced by several common factors. Chemical use is easily proven and the international political consequences for the using nation will make political support difficult. Military benefit may not be worth the political cost. Besides military retaliation, the United States can exert political and economic pressure on an adversary making a decision to use chemicals against the United States a difficult one for any third-world nation.

Additionally, the scenarios point out that an aggressor may not have enough weapons to conduct a protracted chemical war against American forces. If a quick political or military victory is not achieved, the smaller nation is faced with a protracted struggle. Regardless of internal chemical warfare capability, the ability to wage protracted war will take outside support for weapons and the assistance

to make them. The dynamics of the current international political situation make it less likely that potential suppliers will want political destabilization enough to assist in a meaningful way.

In Honduras, or any jungle environment, there is a very small chance of effective chemical weapons use against U.S. contingency forces. The climate and the nature of the terrain argue against large scale employment. Agents are locally effective, but do not spread well and, except for some blister agents, quickly become less potent in the hot wet weather. The lack of adequate sustainment will make the few areas targeted insufficient reason to either drive away American forces or to achieve a decisive tactical result against them.

The desert Middle East is a hotbed of chemical weapons development and use, but use is constrained by several factors related to weather. High daytime temperatures and unstable air currents make nighttime employment necessary. It takes a highly-trained military force to operate effectively at night, and many third-world armies, although large and well armed, lack the required training and experience. The probability of chemical weapon use is greater in the Middle East than in a jungle environment, but still will not be decisive when used alone.

U.S. forces in Korea will meet a well-trained, chemical capable enemy, but again the weather will interfere with effective employment. During the winter months cold weather will retard both offensive employment and chemical defense. Warmer months may see chemical weapon employment, but difficulties in sustainment and the inability to rapidly defeat the South Korean armed forces will subject the North Koreans to

retaliation to population centers close to the zone of operations. Although the U.S. faces the greatest chemical warfare risk in Korea, it is still far from certain that chemicals will be used against U.S. forces.

Implications

What are the implications of third-world chemical warfare on U.S. Army operations? Chemical weapons are hard to control, and with no means of protection, civilians are hostage to chemical weapons. A third-world adversary, guided by a non-Western set of moral values, may not be concerned with civilian casualties. Therefore, U.S. forces must be ready to contend with civilian as well as military casualties in a chemical environment. Also, we must realize that in a confrontation of differing value systems, U.S. forces may be unwilling to retaliate with chemical weapons. Regardless of our stockpiles, we may not use our chemical weapons. However, there is evidence that tactical chemical use can be held in check by, not only by fear of direct retaliation, but indirect as well. Retaliation against suppliers can be effective, as is seen by the low international profile of Libya since the 1986 retaliation bombing by U.S. forces.

Chemical warfare can only be made less mysterious through training and familiarity. It is most likely that chemicals will be used at night, yet it is this writer's experience that U.S. chemical training is conducted almost entirely during the day. Night training in chemical defense consists almost entirely of elevated MOPP postures, but soldiers rarely sleep with masks on. The rear areas stand the greatest chance of

being targeted by chemicals, but NBC training often focuses on MOPP. The use of only MOPP gear exercises when conducting chemical defense training gives the impression that NBC defense is one-dimensional and that it will be business as usual in a contaminated environment. Nothing could be farther from the truth. Especially in rear areas, meaningful support will cease until the contamination is detected, identified, isolated and removed. In an active chemical environment, not even the most experienced military force will be able to continue "normal" operations.

In my opinion, chemical detection, warning, reconnaissance and decontamination are seldom trained for in any meaningful way. Army chemical defense training most often consists of MOPP exercises, and through individual soldier skills practice in Skill Qualification Test and Common Task Test administration. Instead of reinforcing the importance of chemical defense, reliance on these activities alone does just the opposite. Because senior leaders infrequently participate in these exercises, they are not proficient in the skills taught, and their absence shows a lack of emphasis. This lack of emphasis on chemical defense is reinforced on large exercises when the NBC portions are secondary efforts involving an insignificant fraction of the soldiers involved in the exercise. At best, units conduct a series of short-lived, disconnected chemical events that have little effect on the overall exercise.[22] Decontamination exercises which in combat would involve a large part of the unit, instead involve just a few. The Battle Command Training Program is helping to train senior leaders in chemical defense because the OPFOR uses free chemical play. Yet,

because it is difficult to conduct tactics and also to simultaneously counter the effects of chemical weapons, those effects are often wished away."[4] In my experience at division-level and below, all these actions communicate to the chemical specialists that their jobs are not important, tells the soldiers that it is not necessary to learn the skills of NBC recon or decon, and reinforces to the leaders that NBC activities take no time at all and do not need to be planned for. The opposite is true in every case.

This paper has discussed the chemical threat in general and the threat in the third-world in particular, and the U.S. Army's preparedness for chemical defense. The United States Army is a prepared military force. Because it is exercised less often, the level of chemical defense training may not be up to the standards required in combat. Yet, the doctrine is sound and the equipment, although not available in the quantities necessary for a global war, is plentiful enough to support a local conflict. Controlling the spread of chemical weapons may be impossible, but control of the spread of chemical warfare may be possible. From this survey of third-world chemical warfare, it appears that chemical warfare may be self-regulating. Although chemical warfare can cause casualties, it has not proven to be tactically decisive. It will not replace conventional weapons on the modern battlefield. It only adds to the fog of war.

ENDNOTES

[1] U.S. Army. Field Manual (FM) 3-100. NBC Operations. (Washington. D.C. Headquarters. Department of the Army. 17 December 1985). 5-1. The five domains mentioned are an expansion of the three basic principles of NBC defense described in this and other Army NBC field manuals.

[2] James Kendall. Breathe Freely: The Truth About Poison Gas. (London: G. Bell & Sons. Ltd.). All World War I figures are taken from this book. a rather exhaustive though opinionated statistical study of chemical use. Although the use at Ypres is typically cited in most sources as the first modern use of chemical weapons. Dupuy and Dupuy in The Encyclopedia of Military History. Second Revised Edition (New York: Harper & Row. 1986). on page 950. states that the Germans used poison gas against the Russians on 31 January 1915. at the Battle of Bolimov in Poland. but that the Russians did not report it to their Allies.

[3] United States. Report of the Chemical Warfare Review Commission. (Washington. D.C.: Chemical Warfare Review Commission. 1985). 12. It should be noted that nerve agents and toxins were not yet developed as military weapons in World War I.

[4] John Ellis van C. Moon. "Chemical Warfare: A Forgotten Lesson." Bulletin of Atomic Scientists. 45 (July-August 1989). 42.

[5] Ibid.. 42.

[6] Interview with LTC Larry Maupin. Center for Army Tactics. U.S. Army Command and General Staff College. Fort Leavenworth. Kansas. 11 October 1989. Mustard can kill but. according to FM 3-9. Military Chemistry and Chemical Compounds. more than 80% of World War chemical agent fatalities were caused by Phosgene.

[7] According to the Chemical Warfare Review Commission 35% of the chemical casualties of WW I (455.000) were against Imperial Russian troops with no protective equipment.

[8] Suspected or proven chemical agent use between the world wars includes: the British sending Phosgene to India in 1919 for use on the Northwest Frontier. French and Spanish use of chemical agents in Morocco in 1925. Italian use in Abyssinia. 1935-37. Japanese use in China. 1937-44. and German use in a rather unique context starting in the late '30s.

[9] The lists vary by author. but includes: US. USSR. France. Iraq (possessors): Egypt. Syria. Libya. Israel. Ethiopia. Burma. Thailand. China. Taiwan. North Korea. Vietnam. Iran (reported): South Korea (developing). Source is the Chemical and Engineering News. 14 April 1986.

[10] Report of the Chemical Warfare Review Commission. 6-7. Unless otherwise stated the information on classification comes from this document.

[11] U.S. Army, FM 3-9, Military Chemistry and Chemical Compounds, (Washington, D.C.: Headquarters, Department of the Army, 30 October 1975), Table 2-1. Other types of agents are of marginal military use including blood agents, vomiting agents, tear agents and incapacitating agents.

[12] U.S. Army, FM 3-6, Field Behavior of NBC Agents, (Washington, D.C.: Headquarters, Department of the Army, November 1986), 1-1.

[13] U.S. Army, FM 3-10, Employment of Chemical Agents, (Washington, D.C.: Headquarters, Department of the Army, 26 February 1971), 9.

[14] Ibid., 11.

[15] Ibid., 11.

[16] The chemical defoliates used by the United States in Vietnam have long term health risks to those exposed to them, but they were not intended for employment as chemical weapons against the Viet Cong or North Vietnamese enemy. The question of why chemicals were not used in World War II is a more open question, but the answer revolves around the first rule of chemical weapons employment - never use them against a nation which can use them against you. The Germans and the Japanese used chemical weapons in their fashion, but because of a fear of retaliation, never used them against the western Allies.

[17] "Alleged Chemical Use," UN Chronicle, 20 (February 1983), 50. According to the UN, 6000 were killed in Laos, 3000 in Afghanistan, and 1000 in Kampuchea.

[18] Anthony H. Cordesman, "Creating Weapons of Mass Destruction," Armed Forces Journal International, 126:7 (March 1989), 54.

[19] Gary Thatcher, "Poison in the Wind," The Christian Science Monitor, (Des Moines, IA: The Christian Science Monitor Special Report, 13-16 December 1988), 6.

[20] Cordesman, 56.

[21] Thatcher, 3, and David Segal, "The Iran-Iraq War: A Military Analysis," Foreign Affairs, 66:5 (Summer 1988), 955.

[22] Ibid., 14.

[23] Joseph S. Bermudez Jr., "CW: North Korea's Growing Capabilities...," Jane's Defence Weekly, 11:2 (14 January 1989), 54.

[24] Thatcher, 3-15. Entitled "The Trail to Samarra", this article details the activities required to acquire the technology and materials to make chemical weapons.

[25] Ibid., 3-15.

[26] Colin Norman. "CIA Details Chemical Weapons Spread." Science, 243 (17 February 1989), 888.

[27] Discussion with LTC Maupin, 11 October 1989.

[28] Cordesman, 56.

[29] Moon, 42.

[30] U.S. Army Chemical School, FM 3-100, NBC Operations (Draft), (Fort McClellan, AB: 1 September 1989), 1-16.

[31] Moon, 42.

[32] FM 3-100, 2-1.

[33] U.S. Army Command and General Staff College, Student Text 3-1, Fundamentals of NBC Operations, (Fort Leavenworth, KS: 1 July 1988), 1-15.

[34] Thomas J. Hale, Light Fighter Communication - On Today's Chemical Battlefield, (Fort Leavenworth, KS: U.S. Army Command and General Staff College, June 1988), 23.

[35] Theodore S. Gold, "U.S. Chemical Warfare Policy and Program," NATO's Sixteen Nations, 41 (May 1985), 69.

[36] Ibid., 66.

[37] The current edition of FM 3-100 was published in September 1985, but a draft rewrite, dated 1 September 1989, is circulating to field for comments.

[38] U.S. Army, FM 3-3, NBC Contamination Avoidance, (Washington, D.C.: Headquarters, Department of the Army, September 1986), 10.

[39] Detection devices include: M8 Agent Alarm to detect the presence of nerve, choking and blood agents, M8 Detector Paper to detect the presence of nerve and blister agents, M9 Detector Paper to detect the presence of G and V nerve agents, mustard and lewisite, the M256 Chemical Agent Detector Kit which detects most nerve, blister and blood agents, and the M1 Chemical Agent Monitor which detects nerve and blister agents. The M272 Water Test Kit is available to test for the presence of agents in a water source.

[40] FM 3-100, 2-9. The standard reports are:
NBC 1 - (Observers' Initial Report) used to send NBC data to higher headquarters.
NBC 2 - (Evaluated Data Report) used by divisions or higher to pass evaluated NBC data to units.
NBC 3 - (Warning of Predicted Contamination Report) used to report meteorological data to predict downwind hazards.
NBC 4 - (Monitoring and Survey Report) used to report information gotten through an NBC survey.
NBC 5 - (Actual Contaminated Areas Report) used to depict actual contamination plotted from NBC 4 reports.
NBC 6 - (Detailed Information on Chemical/Biological Attack Report) this report summarizes known information about an actual attack.

[41] MOPP levels :
MOPP Zero - mask carried, overgarment, overboots and gloves readily available.
MOPP 1 - overgarment worn, overboots, mask/hood and gloves carried.
MOPP 2 - Overgarment and overboots worn, mask/hood and gloves carried.
MOPP 3 - Overgarment, overboots and mask/hood worn, gloves carried.
MOPP 4 - overgarment, overboots, mask/hood and gloves all worn.
Though not a MOPP level MASK ONLY is a possibility in semi-protected contaminated environments with no blister or vapor hazard.

[42] U.S. Army, FM 3-4, NBC Protection, (Washington, D.C.: Headquarters, Department of the Army, October 1985), 2-5.

[43] MG John G. Appel and MAJ Charles G. Shaw, "Fighting and Winning When the Enemy Turns to NBC on the Battlefield," Army, 38 (August 1988), 44. FM 3-4, NBC Protection, details in Appendix A, performance degradation in specific situations.

[44] Decontamination is further subdivided:
Individual decon - skin decon with the M258A1 decon kit, personal equipment wipedown with the M258A1 kit and operator equipment spraydown with an M11 or M13 decon apparatus with DS 2 solution.
Hasty decon - MOPP gear exchange and vehicle washdown.
Deliberate decon - detailed troop decon and detailed equipment decon.

[45] U.S. Army, FM 3-5, NBC Decontamination, (Washington, D.C.: Headquarters, Department of the Army, June 1985), 1-5.

[46] Fredrick J. Kroesen, et al., Summary Report: Chemical Warfare in the Third World, (Alexandria, VA: Institute for Defense Analysis, April 1987), 1-2.

[47] William Beecher. "Odds of Terrorist Using Gas Put at 50-50". Minneapolis Star Tribune, (7 February 1989), 4. This article quotes L. Paul Bremer, the director of the State Department's office of counterterrorism.

[48] According to Werner Scherdtfeger, (Climates of Central and South America, World Survey of Climatology, H.E.C. Landsberg (Editor-in-Chief), vol. 12, (Amsterdam: Elsevier Publishing Co, 1976), 423) the climate of Honduras is hot and wet, with an average temperature of 19° C (68° F) in the coldest month and sunshine about 50% of the time. Rainfall averages 200 cm (787 inches) each year. September and October are the wettest months (57 inches), and February and April the driest (8 inches). There is high temperature, high humidity, frequent rainfall, and low winds. The topography is rolling with dense vegetation, except in those areas cleared for agriculture or settlement.

[49] Much of the analysis was developed after discussions with Major David Noell and LTC Larry Maupin, Chemical Officers assigned to the U.S. Army Command and General Staff College.

[50] FM 3-100, A-1.

[51] According to K. Takahashi, and H. Arakawa, (Climates of Southern and Western Asia, World Survey of Climatology, H.E.C. Landsberg (Editor-in-Chief), vol. 9, (Amsterdam: Elsevier Publishing Co., 1981), 204) the area around Beruit has a littoral climate with mild dry summers and wet winters. In the winter the temperature averages 10-15° C (50-59°F) and in summer 25-28°C (77-82°F). Rainfall averages 80-100 cm (31-39 inches) a year, with the heaviest in January (15-20 cm) and the lightest in May (5-20 cm). Relative humidity is generally high with up to 90% humidity on summer nights. Prevailing winds are from the south. Although not a true desert the terrain is very dry, open, and with sparse vegetation.

[52] Robert L. Koenig, "CIA: Firms Aid in Making of Chemical Arms". St. Louis Post-Dispatch, (2 February 1989), 12.

[53] Common Soviet agents are: nerve (GB, GD, thicken GD), blister (mustard, thickened mustard), blood (hydrogen cyanide) and choking (phosgene).

[54] FM 3-100 (draft), 1-17.

[55] FM 3-100, B-3.

[56] FM 3-100, A-1.

[57] Bermudez, 54.

[58] According to H. Arakawa, (Climates of Northern and Western Asia, World Survey of Climatology, H.E.C. Landsberg (Editor-in-Chief), vol. 8, (Amsterdam: Elsevier Publishing Co., 1969), 32) the Korean climate is temperate and dry with over 300 days a year with the temperature over 0°

C (32°F) and less than 125 cm (49 inches) of rain a year. From April to mid-October the temperature is usually over 25°C (77°F). It is rainy less than a third of the year with the typhoon season from July to September. From December to late March the ground is snow covered for about 100 days. The relative humidity is highest during the summer rains. Of the three geographical locations in this paper, Korea has colder temperatures than Lebanon, more rainfall and more snow. The topography is very hilly, with deep valleys. The terrain runs roughly north-south, with few cross compartments. Most military terrain objectives, such as population centers, bridges, and roads are in the lowlands.

[39] FM 3-100, B-4.

[40] Kroesen, 3-10.

[41] Iraq recently admitted chemical weapon use, but defended employment by stating that they used it only within its borders.

[42] FM 3-3, NBC Contamination Avoidance, states that casualties for troops in MOPP 1 or 2 may be as high as 45 % for blister agent, 40% for nerve agent, and 10% for nonpersistent agents (p. 1-5).

[43] This may be true even at the National Training Center. During a rotation witnessed by the author in October 1989, the NBC "play" was a part of several missions, but because of the difficulty in replicating the effects of chemical agents, the exercises involved primarily elevated MOPP posture.

[44] Discussions with LTC Larry Maupin, Center for Army Tactics, 11 October 1989, and Advanced Operational Studies Fellow, LTC Gordon Atcheson, on 31 October 1989.

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